## Monitoring Session Objectives

1) Highlighting lessons learned
2) Connecting monitoring with decision making

## Session Organization

- Three Speakers
  - Lessons Learned
  - Lag Time
  - State program Integration

- Input on NPS Monitoring Needs
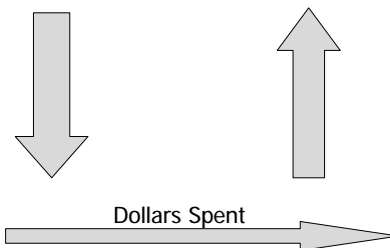
## National NPS Monitoring Program Lessons Learned

26 NPS projects with high probability of showing WQ improvements.

Each is 5–10 years.

## Sharing Your Data…What We Want to Show

NPS Loadings                Water Quality

Dollars Spent

"Demonstrated improvements (data or visual) in water quality generates positive peer pressure to participate. Residents could not see improvements, or the data showing improvements, therefore they didn't connect the project with better water quality. This resulted in no incentives to participate among neighbors"
LMRFR, 2004

## NPS Monitoring

- State level
- Watershed level
  - Problem assessment
  - Tracking
  - Evaluation
  - Source identification/special studies)
- BMP effectiveness

## Locations of NMP Projects

---
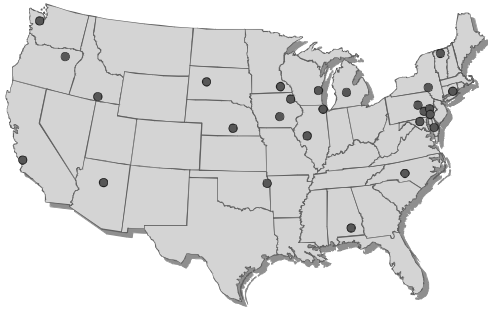
## Mississippi River Basin NMP Projects

| Project Name / Project Group | Treatment | Chemistry | | | | Biology | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity/TSS | P | N | Other | Bacteria | Invertebrates | Fish | Habitat | |
| Lake Pittsfield, IL *Erosion* | WASCOBs, sediment retention basins | ↓ | | | | | | | | |
| Sny Magil Watershed, IA *NM/Comprehensive* | Erosion control, animal waste mgt | ↓ | | | ↑ ↓ DO  Temp | | ⇔ | ⇔ | ⇔ | |
| Walnut Creek, IA *Restoration* | Cropland conversion to native prairie | ↓ | | ↓ | ↓ Pesticides | ⇔ | ⇔ | ⇔ | | 1 |
| Whitewater Creek, MN *Erosion* | Cons. tillage, crop rotations, cropland erosion control, grazing mgt., buffers | | | | | | | | | 2 |
| Elm Creek Watershed, NE *Erosion* | Cropland erosion control, cons. tillage, filter strips, streambank stabilization | ⇔ | | | ⇔ Temp. | | ⇔ | ⇔ | | |
| Peacheater Creek, OK *Nutrient Mgt./Animal Waste* | Waste mgt. Planning & structures, planned grazing systems, stream buffers, critical area vegetation | | | | | | | | | 3 |
| Bad River, SD *Erosion* | Rangeland, grazing, and riparian management | ↓ | | | ↑ Riparian Vegetation | | | | | 4 |
| Range of % change | | 25-40% | | 10 % | 28% (pesticides) | | | | | |

1. Project documented impacts of BMPs on nutrient/pesticide loading rates to watershed. N applications decreased from 11-37%. Pesticide reductions are estimated to be 28%.
2. No results available as full land treatment implementation has not yet occurred.
3. Analysis of post-implementation water quality data not yet complete.
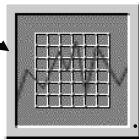4. TSS reductions documented by other monitoring (TMDL, USGS); NMP data not yet conclusive.

---

## From Data to Information
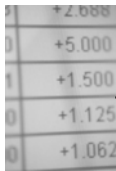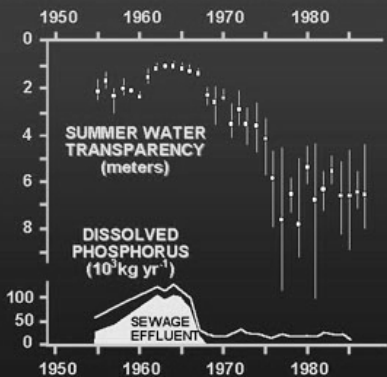


Data

Transforms to

Information

---



State Programs

Projects

NNPSMP Results

---



Diversion of Sewage Effluent away from Lake Washington, and related improvements in the Lake's water transparency
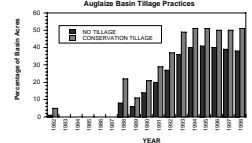
---
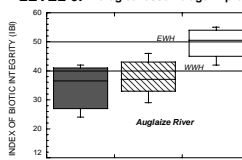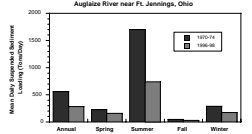
Pollutant mass balance analysis is an essential part of designing land treatment programs (Clean Lakes Program, NYNMP)

Quantitative goals should be tied to restoring beneficial uses

Qualitative goals – the variable by which effectiveness will be documented needs to be stated

## Critical Area-Willingness

- Increased cost-sharing
- Supplemental BMPs (not offered by existing programs)
- Landowner's ability to maintain and operate BMPs
- Extra payments for operation and maintenance activities

Monitoring need not be done implementation unless it is important to document transient effects of implementing structural BMPs

Need specific well-defined monitoring program to measure and attribute WQ change to BMPs

General sampling after BMP implementation is not effectiveness monitoring

Monitoring needs to be focused on parameters most directly related to the WQ goals.

- Parameters most likely to be affected by BMPs
- Explanatory variables that can be used to improve resolution of statistical analysis

Projects must be flexible enough tp
adjust land treatment & monitoring

Projects need to be able to
redirect efforts to new or modified
objectives (not goals) because of
what they learn

---

Priority and time need to be
given to effective reporting and
communication of results

---

**"However beautiful the strategy,
you should occasionally look at
the results."**
*Winston Churchill, 1874-1965*

---

## Changes not seen

- Have not seen an improvement of NPS monitoring at the project level
- Have not seen changes in selection criteria for NPS watershed projects

---

## Basic BMP Information Needs

- Relationship of BMP to the pollution process
- Geomorphic design features
- Effectiveness
- Longevity
- O&M requirements/burdens
- Economics
- Environmental concerns/benefits
- Management

---



Before (left) and after instituting agricultural management
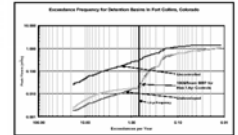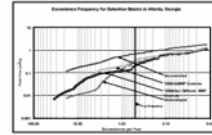practices to minimize stream damage at a Pennsylvania farm.

## Common effectiveness categories

- Biotic effectiveness
- Geomorphic effectiveness
- Hydraulic effectiveness
- Cost effectiveness
- Engineering effectiveness

7/10/2006 25

---

## Hydrologic effectiveness



**How closely does the post-BMP in-stream flow mimic the pre-development flow?**

Effects of design practice for flood control and BMPs on the flow frequency curve.
Nehrke, S.M. et al,. 2003

---

## Geomorphic effectiveness

- The hydrology flow curves to stream-power & duration curves
- Calculate the geomorphically-significant flows and duration
- Calculate the erosion over the reach

---

## Geomorphic effectiveness



---
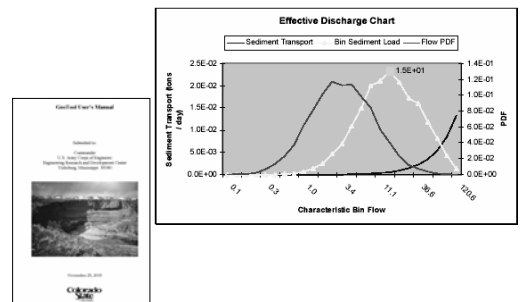
## Biotic effectiveness

- Relative changes in a generally-accepted measure of aquatic health in the receiving water body.
  - ΔIBI score
  - Δpopulation of targeted species
- How to evaluate future projected future populations?

---

## LOGIC MODEL: Monitoring Approach

| INPUTS | OUTPUTS | | OUTCOMES | | |
|--------|---------|---|----------|---|---|
| Technical Financial Social Capacity Building investments ⇨ | Activities ⇨ | BMP installation ⇨ | Flow ⇨ | Channel ⇨ | Biology |
| What we invest | What we do | Who we reach | What results | | |
| | | | SO WHAT?? | | |
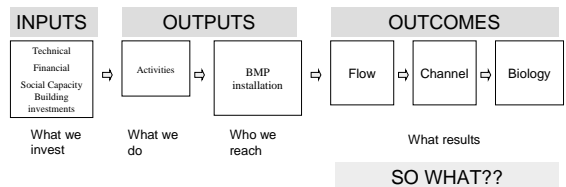
**Erosion Control**

| State | Treatment | Physical/Chemical | | | | Biological | | | | Temperature | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity/ TSS | P | N | Other | Bacteria | Invertebrates | Fish | Habitat | | |
| IL | WASCOBs, sediment retention basins | ↓ | | | | | | | | | |
| MI | No-till, streambank stabilization | ↓ | ↓ | ↓ | | | | | | | |
| MN | Cons. tillage, crop rotations, cropland erosion control, grazing mgt., buffers | | | | | | | | | | 1 |
| NE | Cropland erosion control, cons. tillage, filter strips, streambank stabilization | ⇔ | | | | ⇔ | ⇔ | | | ⇔ | |
| SD | Rangeland, grazing, and riparian management | ↓ | | | ↑ Riparian Vegetation | | | | | | 2 |
| Range of % change | | 25 – 60 % | 57% | | | | | | | | 3 |

Notes: ↓ ↑ ⇔
1. No results available as full land treatment implementation has not yet occurred.
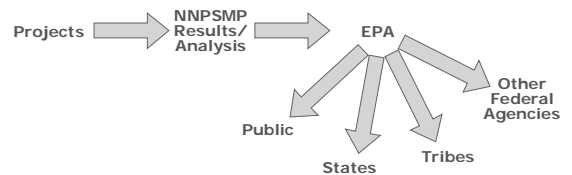2. TSS reductions documented by other monitoring (TMDL, USGS); NMP data not yet conclusive
3. Percent change values are for very general examples only; percent reductions are only valid in the proper context

---

Animal waste management w/o nutrient management, riparian buffers and management of surface and tile drainage will not solve nutrient problems

---

Precision feeding/forage system BMP is now being promoted (NY)
Winter feeding facility (OK)

---

# NNPSMP Information Flow



Projects → NNPSMP Results/ Analysis → EPA → Public, States, Tribes, Other Federal Agencies

---

# Example Recent Products

Tech Notes
- *Lag Time*
- *Exploring Your Data*
- *Trend Analysis*
- *9 Key Elements of Watershed Monitoring Plans*
- *Monitoring Program Design for Watershed Projects*

Lessons Learned
- Subject matter – Comprehensive, Riparian / Grazing, Erosion and Sediment Control, Urban areas, Animal / nutrient management, Restoration
- Geographic focus – Upper Midwest projects, Mississippi Basin projects

---

# NNPSMP Conferences

- 2006 – September 24–28 in Minneapolis, MN
  - www.ctic.purdue.edu/NPSWorkshop/NPSWorkshop.html

- 2007 – Texas (proposed)

- Future location: Villanova

**The End**

We'll welcome any help we can get